COLORADO RIVER RECOVERY PROGRAM **Project No.:CAP-6-RZ**
FY-2001 SCOPE OF WORK for:
Investigation of larval and juvenile razorback recruitment from riverine floodplains

Lead Agency: Utah Division of Wildlife

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Category:
__ Ongoing project
X Ongoing-revised project
_Requested new project
_Unsolicited proposal

Expected Funding Source:
xAnnual funds
_Capital funds
_Other (explain)

I. Title of Proposal:

Investigation of larval and juvenile razorback sucker survival to recruitment in floodplain depressions in the presence of nonnative fishes.

II. Relationship to RIPRAP:

Green River Action Plan: Mainstem
II.A.3. Implement levee removal strategy at high-priority sites.
II.A.3.c. Evaluation.

III. Study Background/Rationale and Hypotheses:

Since the operation of Flaming Gorge Dam, the magnitude and duration of spring peak flows in the Green River have decreased. This, in turn, has reduced the frequency and duration of the riverine-floodplain connection. Floodplains are presumed to be important rearing habitat for the endangered razorback sucker (Wydoski and Wick 1998; Muth et al. 1998; Lentsch et al. 1996). Evidence suggesting the importance of floodplains lies in the characteristics of the floodplains and in the life history of the razorbacks themselves. Elevated temperatures, nutrients and light intensities combine to make floodplain wetlands areas of high primary productivity (Crowl et al. 1998; Wydoski and Wick 1998; Lentsch et al. 1996; Cooper and Severn; 1994). In turn, the production of food organisms (zooplankton etc.) that can be utilized by fish is also high. Wydoski and Wick (1998) summarized data collected in zooplankton studies conducted in the Upper Colorado River

Basin. Zooplankton densities (mean # organisms/liter) were lowest in the main channel (0 - 1.3), higher in backwaters (0 - 13.1) and highest in floodplain habitats (4.2 - 81.5) . The minimum quantity of food required by razorback sucker larvae to survive following swimup is 30 - 60 shrimp nauplii per fish per day (Papoulias and Minckley 1990). This density of zooplankton commonly occurs in floodplain habitats of the Green River, rarely in backwaters and never in the main channel (Crowl et al. 1998; Wydoski and Wick 1998). Reproduction by razorback suckers occurs in the spring during peak flows of the hydrograph when highly productive floodplain habitats are accessible (Muth et al. 1998). This seasonal timing of razorback sucker reproduction indicates possible adaptation for utilizing floodplain habitats (Muth et al. 1998).

The capture of 73 juvenile razorback suckers in a managed floodplain wetland (Old Charlie Wash) dominated by nonnative fish suggests the importance of floodplain habitat to razorback suckers (Modde 1996, 1997). These captures represent one of the few times juvenile razorback suckers have been captured, despite known reproduction (Modde 1996, 1997; Muth et al. 1998). However, survival to recruitment (i.e., adulthood) was not demonstrated in the Old Charlie Wash study. Lack of recruitment is the primary reason for decline of the species (Lanigan and Tyus 1989). Habitat alteration and nonnative fish introductions are considered the primary reasons preventing recruitment (Muth et al. 1998; Wydoski and Wick 1998).

Based on the assumption that floodplain wetlands provide critical rearing habitat for razorback suckers, the Recovery Program initiated an extensive floodplain habitat restoration program (Levee Removal). The goal of the Levee Removal Program was to restore natural floodplain wetland habitats and functions that support the recovery of endangered fish (specifically the razorback sucker) (Lentsch et al. 1996). To accomplish this goal, levees at selected wetlands were lowered to increase the frequency of the riverine-floodplain connection to pre-Flaming Gorge Dam levels. As part of the Levee Removal Program a study was designed to monitor native and nonnative fish utilization of floodplain wetlands. Because there are very few razorback suckers currently reproducing in the system, answers to several important questions pertaining to razorback sucker utilization of the floodplain could not adequately answered. These questions primarily are: 1) Can we entrain larval razorback suckers in the floodplain by lowering levees to improve the riverine-floodplain connection?; and, 2) Can a sufficient number be entrained to ensure some survival from predation by nonnative fish and piscivorous insects? (i.e., How many do we need?) The Old Charlie Wash study provides evidence that the answer to these two questions is yes (Modde 1996, 1997). Additional study questions include: 3) Will razorbacks that survive leave the floodplain for the river environment when presented with the opportunity to do so? 4) And if so, at what age? The strategy to help answer the above questions is to stock larval and juvenile razorback suckers into floodplain wetlands (specifically depressions) then monitor growth, survival and movement from the floodplain to the river.

Depression wetlands were selected because preliminary results from the Levee Removal Study suggested depressions may result in greater razorback sucker recruitment than terraces. The length of time terraces are inundated may not be adequate for larval razorbacks to achieve the size necessary to significantly increase survival. Conversely, depressions can retain enough water to sustain fish year round. As a result, razorback suckers entrained in depressions have additional seasons to benefit from the productivity available in the wetland.

IV. Study Goals, Objectives, End Product:

Study Goal

Evaluate the rate early life stages of razorback suckers can recruit to the adult riverine populations, from naturally functioning floodplain depressions.

Study Objectives

1) Evaluate larval and juvenile razorback sucker survival and growth in naturally functioning floodplain depressions dominated by nonnative fishes.

2) Determine when razorback suckers leave floodplain depressions.

3) Determine how long fish use wetlands and what factors trigger movement from floodplain wetlands to the river.

End Product

Evidence that, in permanent naturally functioning floodplain depressions and in the presence of nonnative fishes, larval razorback suckers can survive and will recruit into the adult riverine population. Estimates of larval survival to recruitment will also help determine the numbers of reproducing adults needed to sustain a population. Growth, survival, and movement data from the floodplains will also be valuable as different razorback stocking strategies are developed.

V. Study area:

Green River floodplain depressions: The Stirrup (RM 276.0), Baeser Bend (273.0), and Above Brennan (RM 268.5).

VI. Study Methods/Approach:

Stock Larval and Juvenile Razorback Suckers in Selected Floodplain Depressions

Larval and juvenile fish will be stocked in The Stirrup (20 acres), Baeser Bend (38 acres), and Above Brennan (40 acres). Juvenile age-1 fish will be stocked in the spring at a density of 50-100 fish/acre. Larval fish will be stocked to match the size and age of larvae that would naturally be transported to the floodplain. Stocking targets for larval

fish will be 1,000-2,500 larvae/acre. These stocking rates will require 98,000-245,000 larval and 4,900-9,800 age-1 razorback sucker.

Table 1. Summary of razorback sucker introductions to date.

Site	Date	Age	Number
Stirrup	10/27/98	age I	125
Stirrup	4/27/99	age I	1,985
Stirrup	5/18-6/2/99	larvae	56,907
Stirrup	5/99	age VII	11
Stirrup	4/12/2000	age I	2,511
Baeser Bend	4/27/99	age I	1,985
Baeser Bend	5/99	age VII	11
Baeser Bend	4/12/2000	age I	2,511
Above Brennan	4/27/99	age I	1,985
Above Brennan	5/99	age VII	11
Above Brennan	4/12/2000	age I	2,511

If requested numbers of fish are not available, one or more sites will be eliminated from stocking until appropriate numbers can be reached. We do not expect survival rates of larval fish to be high and feel stocking at a higher density will increase the likelihood of measuring survival. **The minimum stocking density will become more clear later this year as the fish stocked in 1999 and 2000 are sampled.** The order of priority for stocking will be; 1) The Stirrup, 2) Above Brennan, 3) and Baeser Bend. If there are not enough fish to stock two sites, all of the fish will go into The Stirrup.

Table 2. Summary of proposed razorback sucker introductions.

Site	Date	Age	Number
Stirrup	Spring 2001	Larvae	20,000-50,000 each year
Baeser Bend	Spring 2001	Larvae	38,000-95,000 each year
Above Brennan	Spring 2001	Larvae	40,000-100,000 each year

In addition to stocking larvae directly into the floodplains, larvae will also be stocked into 3m x 3m x 3m mesh cages. The mesh size will be small enough to contain the larvae, but as large as possible to allow free movement of plankton into the cages. This will provide a more controlled environment in which to more closely measure growth rates and survival in the absence of predation.

Monitor Stocked Fish.

In situ sampling will be conducted with fyke nets during the fall and in the spring prior to runoff. The same fyke nets used for levee removal sampling will be used for this study. Fyke nets are ¼" mesh, with a single 25' center lead, 3' x 6' rectangular frame, 5 hoops and 3 funnels. We will sample over 200 net-hours per site both spring and fall. If adequate numbers of larger fish are not collected with these methods, electrofishing will be used in an attempt to more effectively sample. Captured fish will be weighed, measured, PIT tagged, and released. If sufficient numbers of fish are recaptured, a mark-recapture population estimate will be generated. If recapture rates are too low for mark-recapture estimates, relative CPUE numbers will be evaluated.

Light traps will also be set in the wetland depressions in an attempt to measure depletion and movement of razorback larvae immediately after they are stocked. Depletion statistics will be used to determine survival during the light trapping phase.

Fish stocked into cages will be enumerated, weighed and measured monthly.
The cages will be sampled on a rotating basis to minimize handling stress. The cage experiments will ensure that we can capture and monitor some razorbacks for growth and survival analyses, and will provide a control (predators absent) for comparison with estimates obtained from the floodplains.

Monitor Movement and Floodplain Use by Stocked Fish.

During the riverine-floodplain connection period, traps will be set in the breaches of The Stirrup, Baeser Bend, and Above Brennan depressions to monitor fish movement into and out of the sites. These traps will be monitored around the clock for proper function and to collect information about the daily movement of fish. Traps for monitoring movement from the wetlands have been constructed by UDWR personnel. They were tested during 1999 Levee Removal sampling at The Stirrup, Baeser Bend and Above Brennan sites. They were found to be effective. Each trap consists of two side leads and a chamber with a funnel. To completely block levee breaches and catch all fish moving into or out of the

sites, two traps will be placed in the center of levee breaches (parallel to the cut), with leads extending out to the outer banks of the cuts. One trap will catch fish moving into the site and the other will catch fish moving out of the site. Endangered fish caught in the exiting trap will be pit-tagged (if large enough) and released into the river. All Razorback suckers and Colorado pikeminnows caught moving into the wetland from the river will be pit-tagged (if needed) and released into the wetland. Non-native fishes moving into the sites will be enumerated and allowed to enter the site.

The sites do not have outlet structures and would require pumping to drain them. However, we recommend not draining the sites as long as fish are being captured with standard sampling gear, and if no movement from the wetland has been detected. Monitoring to detect voluntary movement of razorback suckers from the floodplain to the river is vitally important to complete floodplain habitat evaluation. Allowing fish to stay in the wetland as described in the above scenario will allow us to evaluate cues that may trigger movement from the floodplain (such as sexual maturity). Draining (by pumps) could be conducted in the fall of 2001 if no fish are being caught with standard gear, and if movement of fish from the wetland has not been detected. Initially, only one site would be drained as a test of this method. It should be noted that it would be unlikely to capture all of the fish even after draining. Deep mud and abundant macrophytes in these large sites make this a difficult task, and we could never be certain what percent of the fish in the sites were collected after draining.

Average growth rates will be determined by collecting length and weight data from fishes captured at each site during fall and pre-runoff spring sampling. If a site is drained, length and weight will also be collected from razorback suckers. Limnological readings will be taken monthly during winter months (following ice formation) to detect potential environmental sources of mortality.

VII. Task Description and Schedule

Task 1: Stock Larval and Juvenile Fish into Selected Floodplain Wetlands

May 2001 (see Table 2)

Task 2-4: Field Data Collections

Cages

Check monthly after stocking through fall 2001

Floodplain Depression Fish Data Collection

2001

Pre-connection sampling (fyke nets, over 200 net-hours per site)

Fish trapping in the breaches during connection (monitored around the clock)

Light trapping immediately after larval introduction

Fall sampling (fyke nets, over 200 net-hours per site)

Optional draining of one site in fall of 2001

Water quality collection

Dec, Jan and Feb both years of study

Task 3: Data Analyses

Task 4: Report Preparation

Annual RIP Report (Dec 2000 and 2001)

Final Report (March 2002)

VIII. FY-2001

-Deliverables/Due Dates

Annual RIP report (12/01)

-Budget-FY-01

Task 1: Stock Fish	
Labor-	500
Travel-	200
Equipment-	0
Other-	0
Task 2: Field Data Collection	
Labor-	
Breach trapping	12,000
Fyke netting	8,000
Light traps, cages, water quality	9,000
Travel-	2,000
Equipment-	3,000
Other-	500
Task 3: Data Analysis	750
Task 4: Report Preparation	
Labor-	4,000
Travel-	450
Total	$40,400

FY-2002

-Deliverables/Due Dates
Annual RIP Report (12/01)
Final Report 3/02

Task 3: Data Analysis	2,000
Task 4: Report Preparation	
Labor-	12,000
Travel	1,000
Total	$15,000

IX. Budget Summary

FY-2001 $40,400
FY-2002 $15,000

X. References

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